

## **Monitoring system for furnace rooms**

### **Assembly and operating instructions**

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## 1.0 Safety instructions

Prior to connecting and starting the equipment read and understand the safety instructions and operating manuals. The operating manuals must be kept in a safe place to give the operating personnel access to the documents at all times.

The manufacturer does not accept any liability for damages caused by improper manipulation and non-observance of the safety rules.

It is imperative to wear proper safety glasses, face guard and refractory clothes when carrying out any work. When working on the equipment at the furnace, a further supervising person must be present.

Never deposit the equipment and components belonging to it within a hot area exceeding 60 °C without water flow and air cooling.

The equipment must also be protected against water penetration and high moisture permeability.

Only qualified service personnel is allowed to open the electrically operated equipment.

Prior to connecting the equipment to the mains, all plugs and cables must be connected.

Do not dismount the plug connections unless electrical power is disconnected.

## 2.0 Application

First the development of furnace probes permitted a central monitoring of combustion chambers, burners, melting ends and other objects hard to reach because of heat and contamination.

Whenever monitoring in a furnace, a boiler or a melting end is required the installation of a furnace probe is recommended.

The small dimensions of a CCD-colour TV camera module with its special furnace probe lens permit the installation even in restricted space.

We can offer a variety of special probe types for different installation depths.



Please contact our technicians to discuss the conditions of use and the material selection of the probe.

## 3.0 Technical Data

### 3.1 General information

- Power supply:.....230 V
- Mains frequency: .....50-60 Hz
- power consumption: .....max. 500 W

### 3.2 Ambient temperature



At the probe tip	max. + 2500°C
Outer furnace wall	max. + 80°C close to the retraction device
Camera cable (silicone)	max. + 250°C
Camera cable (standard)	max. + 80°C

### 3.3 Water supply

**The quality of the cooling water can badly influence the life expectancy of the probe house.**

**Therefore the cooling water should have approximately the quality of drinking water.**

In case of polluted water the use of a water re-cooling system or a heat exchanger is required.

This is also recommended for environment protection and cost saving reasons. There is a considerable reduction of water consumption:

System with heat exchanger	45 %
Closed water cooling system	100%

Due to the low concentration of chlorine ions in mg/l, corrosion damages are much lower.



**Admissible contamination of insoluble materials:**

**Max. 10 mg/l, pH value 6, 0 – 8, 0**

**Permissible water temperature in the cooling system max. 40°C**

**after free outflow behind point of consumption.**

**Delta “T” should not exceeded 3°C.**

The water consumption of a probe in a horizontal or downward inclined position is subject to the furnace temperature.

Standard values:	at + 1000 °C	4 l/min.	2 bar at the probe
	at + 1500 °C	10l/min.	2 bar at the probe
	at + 2500 °C	16l/min	2 bar at the probe

These limit values are not allowed to fall short of at the initial start-up of the system.

They are recalibrated after 24 hours.

See that the water outlet temperature of max. 40 °C is not exceeded.

The water consumption of probes in an upward inclined position is independent of the furnace temperature, approx. 16 l/min. / 5 bar.



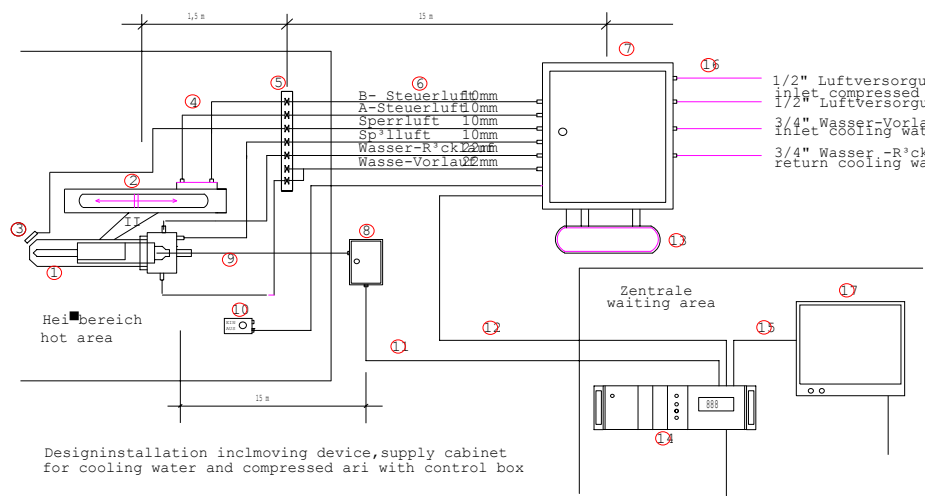
## 4.0 Assembly of the monitoring system



In the following chapter you will get by means of the attached Block Diagram detailed information about the assembly of the system and additional technical details.

The water re-cooling system will be described in a separate user's manual. (upon request)

Block Diagram - assembly drawing of the furnace probe - – Numbered (1-17)



## 1. Probe housing ( PATENT Nr.196 50 983)



Four chamber water- and air-cooled probe housing – different types available - with integrated CCD-camera (optional colour, black or white mode).

Ambient temperature max. 2500 °C at the probe tip.

**The probe should not be exposed to the flames.**

We can offer a variety of water cooled furnace probes type FRS.

Standard length about 1.000 mm, ambient temperature at the probe tip 2.500 °C, water- and air-cooled.

Different fields of view:

Axial (Straight) view, angles of 60° and 90°.

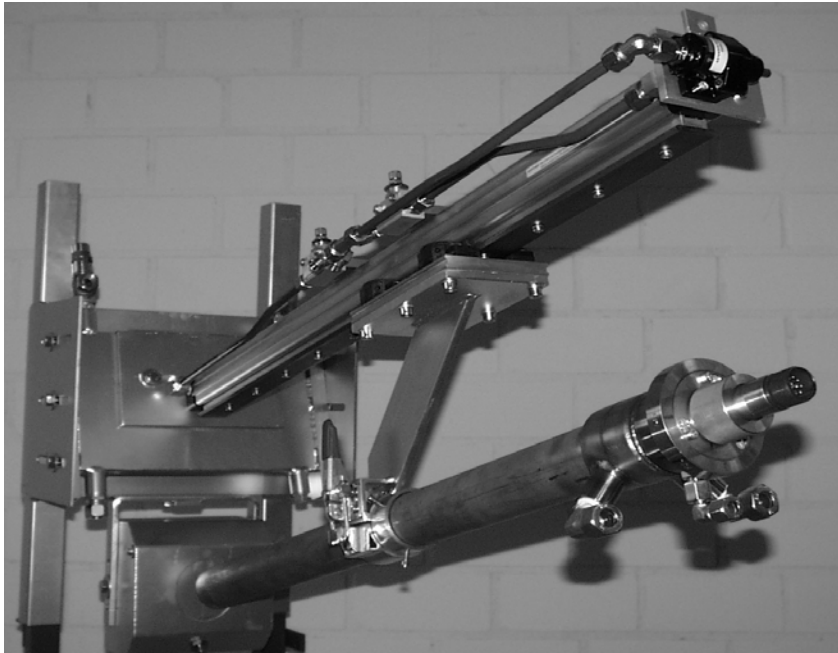
The probes are made of different materials according to their application:

- Steel St
- Steel VA (Vanadium)
- Thermax
- Titanium
- Ceramic coated

Probe length according to the customer's specification:

Maximal probe length	- 4 meters
Dia of standardized probes	- 60 mm
Dia of probes longer than 1500 mm	- 70 mm

## 2. Retraction device



Retraction device with (transfer) band cylinder

For the emergency retraction of the probe there are different types available:

- a) Retraction device with (transfer) band cylinder for automatic retraction.  
The device will be retracted automatically out of the danger zone in case of water shortage, air shortage, an excess of temperature or a power failure. The temperature of the cylinder is reduced by the help of a water cooled shield which increases the exposure time of the cylinder (ambient temperature at the device max. 80°C). The probe orifice in the furnace wall is closes by a shutter.
- b) Other types suiting the plant's requirements are possible.
- c) Manual emergency retraction is required in case of water or air shortage, an excess of temperature or a power failure by an authorized person within max. 2 minutes.

## 3. Air Nozzle

The unit is fitted with a 10 mm dia air nozzle at the observation orifice in order to prevent from overpressure or flame exit through the furnace orifice.

The air volume regulation which depends on the prevailing overpressure in the furnace is to be set by a ball valve fixed on the media bar (5) so that the flames penetrating to the outside are neutralised (forced back).

## 4. Connecting Hoses

The flexible connecting hoses ( length 1700mm) attached between the media bar, the retraction device and the probe are available in 2 different types:

PTFE-hoses	ambient temperature 200°C
standard hoses	ambient temperature 80°C

Both types are metal coated.

## 5. Media bar



The media bar mounted in the region of the probe (approx. 1,5m) is used as a locking device for the permanent *Ermeto* piping between media cabinet and media bar.  
By means of the ball valves on the media bar, the different feedings can be cut off on demand.

## 6. Pipework

Piping between media cabinet and media bar is to be done as follows:

Water flow and return	22 mm $\frac{3}{4}$ "
Sealing air and scavenging air	10 mm <i>Ermeto</i>
Retraction device	10 mm <i>Ermeto</i>



**Avoid piping in hot areas.**



## 7. Media cabinet

The testing and switching devices ( water and air) fitting in a compact metal housing protected from splash water have been developed for a quick failure diagnosis.

A solenoid valve is responsible for the retraction and feeding of the transfer device.



All necessary water flow and air pressure control instruments fit in the compact metal housing protected from dust and splash water (individual setting) as well as the 2/5 directional control valve of the cylinder.

Diagram of connections media cabinet enclosed.

## 8. Camera Cable – Black Box

Housing 150 x 150 x 60 mm, protected from splash water with integrated 30 polar socket ledge connecting the camera system cable to the high-temperature camera cable. There is no need for an additional air cooling of the high temperature camera cable. The housing must be installed outside the hot area, at a distance of approx. 10 m of the camera.

## 9. Camera Cable

The camera system cable includes a control - and a coaxial video transmission line. There are two different types of camera system cables:

Silicon cable up to an ambient temperature of 200 °C (camera cable)  
System cable up to an ambient temperature of 80 °C (camera cable/system control cable)

## 10. Switch Box

The switch box fitting in the region of the retraction device permits the local feed and retraction of the camera probe for maintenance work.

Feeding of the probe is only possible by means of the key switch at the switch box –  
For retraction of the probe press the key “retraction device” at the control unit (q.v. point 14).



### **Attention:**

**While retracting the probe a safety margin of at least one meter has to be respected.**

## 11. System Control Cable

The 19 mm system control cable can be laid on existing cable brackets in the cold area. The system cable itself will not be influenced by already laid electric cables.

## 12. Control Cable

We use a 12 x 0,5 mm control cable, dia 12 mm, max. temperature 60°C, to transmit all signals from the switching devices (media cabinet) to the control unit.

## 13. Air Reserve Tank

The air reserve tank (volume 5 l) is mounted at the media cabinet.  
The filling of the tank by means of a non-return valve is supervised by a separate pressure control unit. In case of an environmental air shortage the stored air volume will be used for the repeated retraction of the probe.

## 14. Control Unit

The plug-in panel fitting in a 19” box will be installed in the waiting area.  
Continually visual display of the internal temperature of the probe on the front panel (37°C – 47°C)  
It is recommended to mount the control unit so that the display of the front panel can always be observed.  
Power requirements: 230V/16A  
Camera system cable, control – and video cable are connected to the control unit.  
Press the key (retraction device) for retraction of the probe.  
For feeding of the probe press the entry key on the switch box (q.v. point 10).  
This control unit is recommended as a standard device. Also available are units in a splash water protected housing or in other performances.

## 15. Video Cable

Video transmission of the control unit by a protected video cable.

The transmission to the monitor doesn't need amplification up to a distance of 500 m.

The cable can be laid regardless of other power cables within the cable channel.

Two-wire and glass fibre transmissions are possible, too.

## 16. Feeding lines

The water supply lines (feeding and discharge) are conducted in  $\frac{3}{4}$ " copper leads to the media cabinet.

At a fireplace temperature of 2500 °C the consumption amounts to approx. 960l/h.

In order to reduce the cooling water consumption we recommend an enclosed water re-cooling system.

The water re-cooling system is subject to a separate operator's manual.

## 17. Monitor

The choice of the monitor respectively of the screen diagonal/screen size depends on the distance between monitor and observer.

Available colour and black and white monitors between 13 and 56 cm (screen diagonal) as well as flat screens of different dimensions.

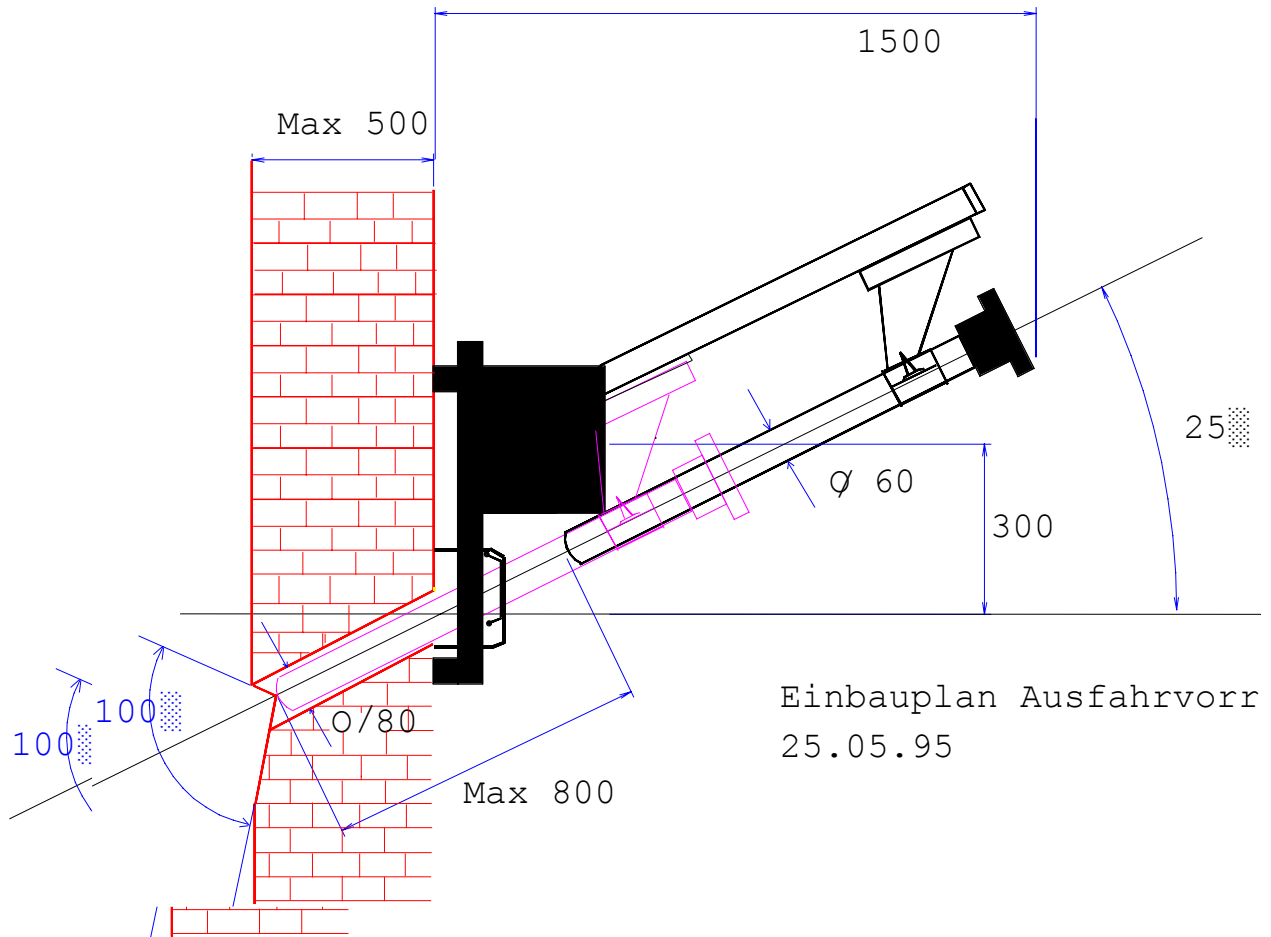
While using colour monitors avoid influences by magnetic fields. You may transfer the video signal to a PC for graphic processing.

## **5.0 Recommended spare parts**

In order to increase the working reliability and the ease of servicing, we recommend the following testing instruments and spare parts:

- probe housing
- furnace probe lens
- silicon camera cable, completely assembled with connectors
- a set of PTFE high pressure refractory hoses
- CCD-furnace probe camera
- 2 m test cable and test box
- testing monitor with 30 polar plug.

## 6.0 Preparatory assembly works



The installation of a probe system needs sufficient space in the region of the furnace opening. The drawings of the retraction device give detailed information about the space requirements. There must be sufficient place on the man-carrying/working platform for the technicians to work on the probe.

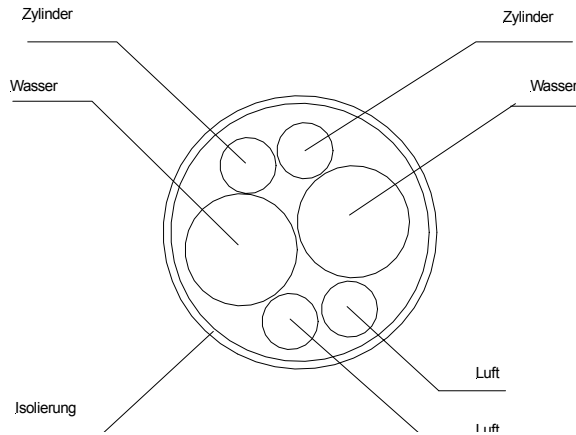
**In this area the temperature should not exceed 80°C.**

**In case of an excess of temperature we recommend the mounting of sheet metal heat deflectors under the working platform.**



## 6.1 Installation of water connections

**The installation of the water-conveying pipes to the media bar should be made outside the hot area.  
It is advantageous to lay the pipes in bundles and to isolate them.**



The pipes are made of steel, copper or Ermeto.  
A cleansing filter should be attached to the water and scavenging air pipes.

## 6.2 Installation of compressed air connections

The compressed air supply is divided into three branches:  
Sealing air, scavenging air and control air (cylinder).

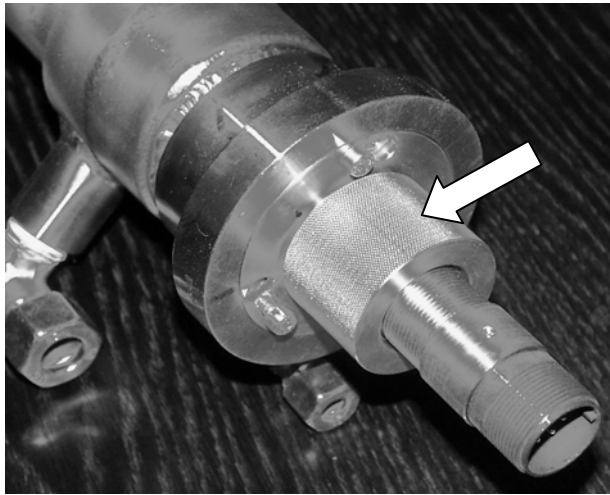


**These pipes are laid from the media cabinet to the media bar in a 10 mm Ermeto-pipe.  
We recommend to lay the water and air supplies in bundles and to isolate them.**

## 6.3 Mounting of the furnace probe camera into the probe housing

The mounting of the furnace probe camera on the essential camera carrier insert is realised at the factory. In case of repair works or cleaning please follow our reassembly instructions: (see attached drawings)

The camera with the probe must be brought into an axial line to the aluminium carrier pipe. The lock nut has to be adjusted in such a way that the lens tip, centred to the viewing orifice of the probe, is positioned approx. 2-3 mm backwards (without limitation of the image). After these preliminary works the camera carrier can be inserted into the probe. The camera flange is tightened by 3 hexagon socket head screws (Allen screws). Now the camera device can be connected to the camera cable or to the control cable. Starting the unit, the image on the monitor must be aligned in an horizontal level by means of the camera carrier in the housing.



Unscrew the corrugated thread marked in the picture and turn it counter clockwise for alignment. Tighten the thread after alignment.

For wiring of the cable form inside the camera carrier please refer to the enclosed drawings.

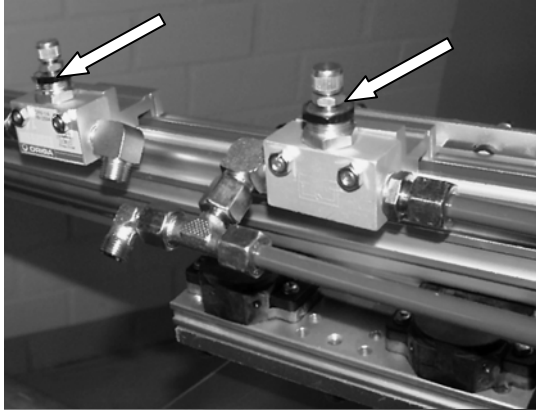
## 7.0 Mounting of the retraction device

The mounting of the retraction device should be carried out in the presence of an *SVA* technician and according to his instructions. For space requirements look at the attached dimensional drawings – retraction device. The unit is designed for an adjustment within a range of  $\pm 45^\circ$ .

This is also possible in a horizontal or vertical range of 110 mm. The weight of the retraction device, including furnace probe, is about 45 kg.

As a result you must ensure the stability of the retraction device support.

**Using a retraction device with water cooled mounting plate, the unit must be cooled immediately during installation.**



The damping valves attached at the band shielded cylinder must be adjusted so that while retracting or inserting the probe a sensible damping of the mechanical movement takes place shortly before reaching the final position. It must be guaranteed that the movement in the middle of the cylinder is carried out as quick as possible. The adjustment, made by turning the knurled screws clockwise or anti-clockwise and must be fixed by a lock nut.

**The final adjustment of the retraction device must ensure that the probe does not come into contact with the furnace walls while being inserted.**

## 8.0 Mounting of the media cabinet

The installation of the media cabinet is made at a distance of about 15 m away from the probe.

Within this area the ambient temperature should not exceed + 50°C.

For pipe dimensions please have a look at the enclosed drawing. For the water and air feeding lines, we recommend the installation of water and air filters supplied with upstream reducing regulators.

Pay attention in particular to the connection of the water conduits.

### 8.2. Setting of the monitoring devices

While starting the devices the maximum values have to be set according to the description. Any modifications made please respect the following specifications.



**The air pressure control unit must be adjusted to 2,5 – 3 bar. The contact maker of the water flow control unit should be set to 800-960 l/h while starting the unit.**

Having reached a constant temperature in the probe, the flow can be reduced.

The max. internal probe temperature should not exceed 47 °C. The probe temperature is visualised on the display of the control unit.

For the air adjustment a distinction between sealing air and scavenging air is to be made:

To neutralize the overpressure in the furnace, the sealing air must be adjusted in order to prevent the flames from penetrating to the outside.



The scavenge air value is to be set at 2/3 less than the sealing air value.

**The scavenging air must be dry and oil free because it will come into direct contact with camera and lens while cooling the camera housing.**

**The disregard of these demands will cause an inevitably impurity of the lens.**

**Furthermore after the first 24 hours after the initial operation of the monitoring device you must pay attention to:**

- the water flow control
- the air flow control
- the air pressure control
- an excess of temperature

**A water circulation free from air must be guaranteed (deairing).**

**When the limit values have been exceeded or under-run the retraction device must withdraw the probe automatically out of the hot area.**



## 9.0 Start-up of equipment

### 9.1 Camera

The camera has been preset at the factory ( focus and aperture).

If through scavenging air, oil or water have penetrated to the inside of camera or lens the camera must be purified and focussed again.

Focussing :

- switch on the camera
- transmit the video signal to the monitor (test cable)
- install the objective
- open the aperture/pinhole
- bring into focus an object at a distance of approx. 7 m.



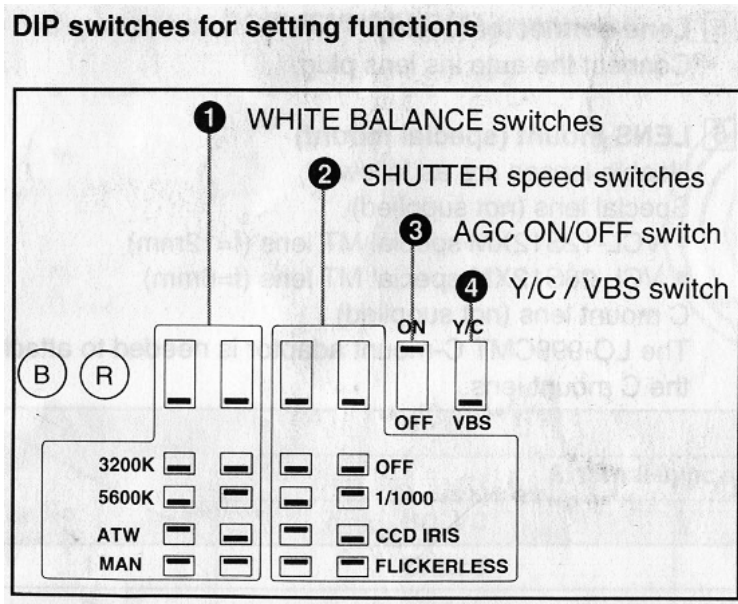
For adjustment, unscrew the lock disk of the objective and turn the knurled ring for fine focus. Now tighten the lock disk. Using a filter this procedure must be repeated. The filter between lens and chip must be arrested by a lock ring.

For obtaining an optimised picture quality close aperture according to the brightness of the object (at f 8-16 for pictures in the furnace).

Now the camera can be introduced into the probe case.

Adjustment of the camera dip switches according to the personal requirements.

## 9.2 Operator's Manual for DIP-Switches of furnace probes



On the right side of the camera there are 6 DIP-switches and 2 potentiometers (faders).

block "1" (switch 1 + 2)	White Balance switches
block "2" (switch 3 + 4)	Shutter speed switches
block "3" switch 3	AGC (auto gain control) ON/OFF switch
block "4" switch 4	Y/C/VBS switch

### Settings block "1" : WHITE BALANCE switches

switch 1 + switch 2 "OFF" (switch down) = 3200 K  
Setting for indoor shooting under artificial light.

switch 1 "OFF" (switch down) + switch 2 "ON" (switch up) = 5600 K  
Daylight setting.

switches 1 + 2 "ON" (switches up)  
Manual setting of the colour temperature by means of potentiometer B + R.

### Settings block "2" SHUTTER speed switches

switches 3 + 4 "OFF"	= standard operation
switch 3 "OFF" + switch 4 "ON"	= SHUTTER 1/1000
switch 3 "ON" + switch 4 "OFF"	= auto-iris
switch 3 "ON" + switch 4 "ON"	= unconsidered (RGB mode only)

### Settings block "3" AGC (auto gain control) ON/OFF switch

Switch 5 "ON" = AGC ON (auto gain control)  
Switch 5 "OFF" = permanent intensification 0 dB

### Settings block "4" Y/C –VBS switch:

Switch 6 "ON" = black-white setting  
Switch 6 "OFF" = VBS colour setting

## 9.3 The probe

The probe made of VA or Thermax is designed for applications using water or air in hot areas with a max. temperature of 2500 °C at the probe tip.

The following points should be observed while putting the probe into service:

**The probe may only be inserted into the hot area after complete deairation of the water circuit.**

Having connected all water hoses and after the first hour of operation the probe should be removed from the probe holder so that the deairation can be realised as follows:

Hold the probe case alternately with the tip pointing upwards for about 10 sec., and with the tip pointing downwards for about 10 sec..

Repeat this procedure for several times.

After complete ventilation the water circulation should be checked for air bubbles by means of the inspection glass (flow control) which is mounted in the media bar.

Perfect circulation without air bubbles must be guaranteed.

**While re-inserting the probe into the probe holder, the probe tip should seal with the internal edge of the furnace wall. According to the lens type it could be advantageous to retract the probe as far as possible to avoid limitation by the furnace wall.**

**In any case the probe should not be exposed to the flames!**



## 9.4 Retraction device

Prior to the initial operation of the retraction device respect the following items:

- The adjustment of forward and return movement is realised by means of damping valves.
- Perfect insertion of the probe camera into the furnace wall. – operational test –
- Shutting off the air and water flow or in case of deenergizing the probe must be retracted automatically.
- That also applies to an excess of temperature.



## 9.5 Control unit



The control board mounted in a 19" housing, switching element for the control air, water and temperature.

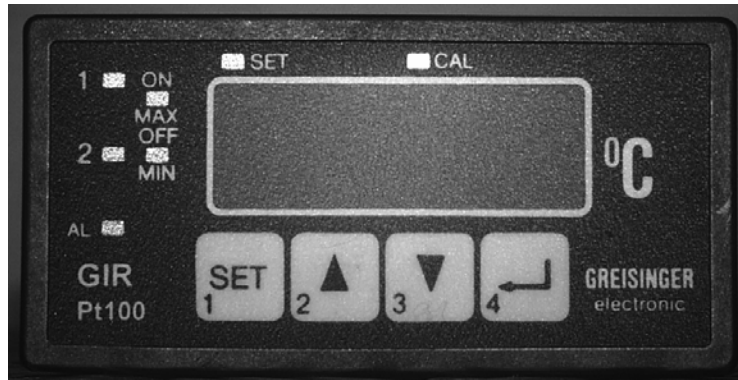
All necessary power units for camera and electronics are integrated in the control unit. The switchboard for control of the different functions and the display of the internal temperature of the probe fits on the front panel.

Connectors to the camera control system, video socket, alarm output and couplers for the control cable are installed on the rear panel.

The DIP-switches mounted on the printed boards have been set by the factory according to the requirements (contacts media bar).

In case of additional switching contacts the DIP-switches are closed or opened according to their switching function.





## Indication of the Actual Temperature

After the supply voltage has been applied, the GIR200 PT100 carries out a segment test for about 8s. Afterwards, the actual temperature will be indicated, provided that a temperature sensor is connected. The LED 1 indicates the condition of the relay (LED illuminates: relay has picked up).

## Indication / adjustment of the on-position of the switching output 1

Call by: button 1; repeatedly push the button until the LED's "SET", "1" and "ON/SP" illuminate.  
 Indication: The seven-segment display indicates the on-position of the switching output 1.

Adjustment:

Adjust on-position by means of button 2 and 3.  
 The LED's "1" and "ON/SP" start flashing.

The buttons 2 and 3 have a "roll-type function". That means, that the closing point is increased by 1 digit (button 2) and decreased (button 3) respectively, when it is shortly actuated (less than 1 second). If actuated for a longer time (longer than 1 second), the value begins to "roll" up and down.

Once a "rolling" of approx. 150 digits has been carried out, the "rolling procedure" gets accelerated by the factor of 10.

Confirm the new on-position with button 4.

LED "1" and "ON/SP" stop flashing.

Shift back to the indication of the actual measuring value by repeated pushing of the button 4.

## Indication / adjustment of off-position of switching output 1

Call by: button 1, repeatedly push the button until the LED's "SET", "1" and "OFF/Hy." illuminate.  
 Indication: The seven-segment display indicates the off-position of the switching output 1.

Adjustment:

Adjust the off-position by means of button 2 and 3.  
 The LED's "1" and "OFF/Hy." start flashing.

The buttons 2 and 3 have a "roll-type function". That means that the switching point is increased by 1 digit (button 2) and decreased (button 3) respectively when it is shortly actuated. If actuated for a longer time (longer than 1 second) the value will begin to "roll" up and down.

Once the "rolling" of approx. 150 digits has been carried out, the "rolling procedure" gets accelerated by the factor of 10.

Confirm with button 4 the new off-position.

LED "1" and "OFF/Hy." stop flashing.

Shift to the indication of the actual measuring value by repeated pushing the button 4.



## Offset Adjustment:

The GIR200 Pt 100 is factory-calibrated onto Pt100 sensor according to DIN43760 etc. Thus, the control unit is immediately usable as soon as the temperature sensor and the supply voltage have been connected.

It is possible that in certain applications an offset adjustment becomes necessary.

(e. g. for the compensation of influences by cable resistances caused by the application of two-conductor or three-conductor connection.)

In this case please proceed as follows:

Push button 1 (front side).

Additionally push (approx. 1 s) mini push button on rear side of the GIR 1002 Pt100 (behind the terminal for the sensor) until the LED "CAL" (front side) illuminates.

LED's "Scale", "OFF/Hy." and LED "CAL" illuminate.

The display shows the offset value memorized in the GIR 1002 Pt100 (zero offset).

Set the new offset value by means of the buttons 2 and 3 (LED "OFF/Hy." starts flashing). Afterwards confirm with button 4.

Example:

If at a temperature of 0.0 °C the GIR 1002 Pt100 indicates a temperature of 0.3 °C due to a longer connection cable (only in case of two-conductor and three-conductor connection), then the GIR 1002 Pt100 can be aligned to 0.0°C by the input of an offset value of 0.3.

### **Caution:**

This value setting influences the indication of the GIR 1002 Pt100.

Due to this reason, the offset value should normally be set at 0.0.

## Error codes

The occurrence of inadmissible conditions in the system leads to the indication of corresponding error codes.

The following error codes are defined:

### **FE (Error) 1: Measuring range exceeded**

This fault message signals that the measuring range of the GIR 200 Pt100 has been exceeded.

Possible fault cause:

- Temperature to be measured is higher than 199.9°C.
- Sensor is defect.
- Sensor connecting cable is interrupted.

Counter-measure: Reset FE 1 as soon as the measuring range is not any more exceeded.

For this purpose, please check your PT100 sensor or the connecting cables.

### **FE (Error) 2: Measuring range fallen below**

This fault message signals that the measuring range of the GIR200 Pt100 has been fallen below.

Possible fault cause:

- Temperature to be measured is less than -50.0°C.
- Sensor is defect.

Set the new offset value by means of the buttons 2 and 3 (LED "OFF/Hy." starts flashing) and confirm then with button 4.

Example:

If at a temperature of 0.0 °C the GIR 1002 Pt100 indicates a temperature of 0.3 °C due to a longer connection cable (only in case of two-wire and three-wire connection), then the GIR 1002 Pt100 can be aligned to 0.0°C by setting 0.3.

### **Caution:**

This value setting influences the indication of the GIR 1002 Pt100.

Due to this reason, the offset value should normally be set at 0.0.

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Possible fault cause:

- Temperature to be measured is higher than 199.9°C
- Sensor is defect.
- Sensor connecting cable is interrupted.

Counter-measure: Reset FE 1 as soon as the measuring range is not any more exceeded.

For this purpose, please check your PT100 sensor or the connecting cables.

### **FE (Error) 2: Measuring range fallen below**

This fault alarm signals that the measuring range of the GIR200 Pt100 has been fallen below.

Possible fault cause:

- Temperature to be measured is lower than -50.0°C
- Sensor is defect
- Sensor connecting cable is interrupted or short-circuited.

Counter-measure: Reset FE 2 as soon as the measuring range will not any more fallen below.

For this purpose, please check your Pt100 sensor or the connecting cables.

If any of the indicated error codes or malfunctions should occur, check first of all the corresponding switching points as well as the entered offset value of the GIR200 Pt100.

## 9.7

## Maintenance

To provide security for the operational reliability of the equipment, the maintenance should be included in the daily inspection round.

During this inspection the functions in the media cabinet and the probe temperature should be checked. In addition, a function check of the telescope should be carried out.

Please make also sure that the used scavenging air of the camera is kept dry and oil-free.

However an impurity of the probe tip is established, clean it with greatest care.

It is strictly prohibited to use any cleaning agents with biting effect and sharp-edged or pointed devices.



**Retract the probe out of the furnace when carrying out any maintenance work.**

**It must be ensured that by no means flames can get out of the inspection glass.**

**If necessary, it must be enclosed with corresponding fire-proof material.**

## List of materials - media cabinet SVA

Designation	Type	Order no.	Technical data
water flow meter	RVD,MS	FRM251	2,0-16L/min. contact 1,5A ½"
air flow meter	SN480-A2-GR	FRM260	G1/2",24Vrelaise0-25sec.S. short
pressure control device air	901.41WE	FRM259	EW1,5+0,15/1,3+0,15BAR
control valve 2/5	S9 581	FRM261	RF.1,4"
switch cabinet	LA.M1060	FRZ419	dimensions 600x600x200
air reservoir	5L	FRM262	5.1 console
Hensel box with terminals	9100	FRM255	Modular terminals 9700AGS35
back pressure valve	RHD	FRM263	ERMETO
screwing	SV10PL	FRM266	ERMETO
screwing	SV22PL	FRM265	ERMETO
screwing	EGE22-LR-ED	FRM267	ERMETO
screwing	EVW10-PL	FRM268	ERMETO
Stop valve ½"	DN 15,ENIL 1201	FRM253	Water
Stop valve	DV 10-PL	FRM252	air

## List of materials - retraction device SVA

Main cylinder	OSP-P32-00100.32D	FRA204	stroke 800-Viton
king post	E1-large	FRA205	for OSP32
back pressure control valve	DRV	FRA202	¼"
fastening cylinder	DZS30225	FRA203	with mounting plate
high speed locking device	D60mm	FRA210	
shield	D60mm	FRA211	water-cooled
safety valve	2 bar	FRA209	½"
housing	D60mm	FRA206	Thermax with furnace opening cap

## List of materials- furnace probe SVA

Probe housing	D60mm 1m long.	FRG100	½" water, 10mm air, Thermax tip
CCD colour camera	XC999P (XC555)	FRK151	½" 12V PAL
lens 4mm straight view	Probe lens	TVO571	4mm ½" filter 16 x
Control unit	STG95 STD	FRS364	19" case
Media bar	6 Ventilen	FRZ405	Connection water air cylinder
hoses	PTFE	FRZ406	7 pieces 3x15mm,4x10mm